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EXAMINER	
TORRES, JUAN A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/730,452	SHATTIL, STEVE J.	
	Examiner	Art Unit	
	Juan A. Torres	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 December 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application). The disclosure of the invention in the parent application and in the later-filed application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

The disclosure of the prior-filed application, Application No. 60/431,877, filed on Dec. 9, 2002 and Provisional Appl. 60/219,482, filed on Jul. 19, 2000, fails to provide adequate support or enablement in the manner provided by the first paragraph of 35 U.S.C. 112 for one or more claims of this application. Claims 1-13 are supported by Provisional Appl. No. 60/435,439, filed on Dec. 20, 2002.

Drawings

The drawings are objected to because:

a) The recitation in Figure 14 block 1402 "RX" seems to be improper (see specification page 43 lines 19-20 and 25-26); it is suggested to be changed to "RF"

b) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "536" and "535" (figure 5B); "302.1" to "302.N" (figure 10A); "1131", "1132" and "1139" (figure 11B).

c) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "1200" (page 40 lines 1, 2 and 16); "408" (page 44 line 3); "1414" (page 44 line 3).

d) The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "A multicarrier transmission system adapted to reduce the effects of high PAPR including: a CI coder adapted to spread at least one data sequence with at least one set of CI codes for generating at least one set of CI-coded symbols, a sub-carrier generator adapted to map the at least one set of CI-coded symbols onto a plurality of subcarriers, a plurality of combiners adapted to combine sets of the plurality of carriers for producing a plurality of CI-coded time-domain sequences that are characterized by low PAPR, and a plurality of power amplifiers coupled to the plurality of combiners, the amplifiers adapted to amplify the plurality of CI-coded time-domain sequences" (claim 10); and "an amplified-signal combiner coupled to the plurality of power amplifiers" (claim 11) and "at least one of a set including an antenna, a waveguide, and a multi-port junction" (claim 12) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure

number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification. Some of the errors found in the specification follow below.

The disclosure is objected to because of the following informalities:

a) 35 USC 112 first paragraph requires that "the specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms", the recitation is objected because in lines 1-6 of page 7 "The CI system of the invention provides for control and programmability of the frequency spectrum of multicarrier and single-carrier signals. CI signal synthesis and analysis (i.e., decomposition) may employ combinations of block

transforms and sliding transforms, such as described in the U.S. patent application entitled "Orthogonal Superposition Coding for Direct-Sequence Communications," filed on Apr. 16, 2003, and incorporated by reference herein" is improper, because it doesn't provide the serial number of the application; it is suggested to include the serial number of the application, so it can be identified in a full, clear, concise and exact terms.

b) The recitation in lines 14-17 of page 10 "Various types of subcarriers and corresponding CI processing relating to wireless communications are described in the U.S. patent application entitled "Method and Apparatus for Using Multicarrier Interferometry to Enhance Optical Fiber Communications," filed on Nov. 2, 1999, and incorporated by reference herein." is improper, because it doesn't provide the serial number of the application; it is suggested to include the serial number of the application, so it can be identified in a full, clear, concise and exact terms.

c) The recitation in lines 18-22 of page 11 "A guard interval may be implemented by padding trailing zeros (i.e., a null signal) to the end of each transmitted symbol, such as described in B. Muquet et. al., "OFDM with Trailing Zeros Versus OFDM with Cyclic Prefix: Links, Comparisons and Application to the HiperLAN/2 System," which is incorporated herein in its entirety" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

d) The recitation in lines 26-29 of page 11 "Accordingly, C. V. Sinn, J. Gotze, M. Haardt: "Efficient Data Detection Algorithms in Single- and Multi-Carrier Systems

Without the Necessity of a Guard Period", ICASSP 2002, Orlando, is incorporated by reference" which is incorporated herein in its entirety" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

e) The recitation in line 5 of page 14 "f_o of 20" is improper, because it doesn't provide the units; it is suggested to be changed to "f_o of 20 Hz".

f) The recitation in lines 1-4 of page 15 "It is well known in the art to apply windowing to smooth the transitions between adjacent data symbols, and thus, increase the spectral roll off. The following cyclic prefix shaping technique is well known and described in Chapter 2 of R. Van Nee and R. Prasad (OFDM for Multimedia Communications, Artech House, 2000)" which is incorporated herein in its entirety" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

g) The recitation in lines 11-12 of page 15 "In F. Giannetti, "OFDM Communications Primer", Intellon White Paper #0032, March 1999)" which is incorporated herein in its entirety" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

h) The recitation in lines 15-17 of page 15 "J. M. Paez-Borrallo, "Multicarrier vs. Monocarrier Modulation Techniques: An Introduction to OFDM", BWRC Retreat 2000" which is incorporated herein in its entirety" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

i) The recitation in lines 26-28 of page 15 "A. Czylwik, "Comparison between adaptive OFDM and single carrier modulation with frequency domain equalization", VTC, pp. 865-869, Phoenix, 1997" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

j) The recitation in lines 13-14 of page 22 "In M. Haardt, "Smart Antennas for Third Generation Mobile Radio Systems", Stanford Colloquium on Smart Antennas, July 1999" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

k) The recitation in lines 13-14 of page 22 "H. Sari et. al., "Transmission Techniques for Digital TV Broadcasting", IEEE communications magazine 33(2) February 1995" is improper, because it doesn't provide the details of the publication, including where was publish, when, publisher, author and pages; it is suggested to

include of the details of the publication so it can be identified in a full, clear, concise and exact terms.

l) The recitation in line 17 of page 37 "dk" is improper (see figure 10B); it is suggested to be changed to "d_k".

m) The recitation in line 8 of page 40 "receivers 1204" is improper, because 1204 is a symbol-to-time mapping module (see page 40 line 12).

Appropriate correction is required.

Claim Objections

Claims 1-9 are objected to because of the following informalities:

As per claim 9, the recitation in line 1 of claim 9 "A CI transmission system employing PAPR-reduction signaling" is improper, because the terms CI and PAPR have to be defined; it is suggested to be changed to "A Carrier Interferometry (CI) transmission system employing peak-to-average power ratio (PAPR) reduction signaling"

As per claims 2-9, they are objected because they depend directly or indirectly from claim9, and claim 9 is objected.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 13 is rejected under 35 U.S.C. 102(b) as being anticipated by Natarajan ("Throughput enhancement in TDMA through carrier interferometry pulse shaping", 52nd Vehicular Technology Conference, 2000. IEEE VTS-Fall VTC 2000. Volume 4, 24-28 Sept. 2000 Page(s): 1799- 803 vol.4). Natarajan discloses a multicarrier signal generator including a pulse-train generator adapted to generate a sequence of pulse waveforms having a predetermined spectrum subcarriers (figure 1 section 3 first paragraph page 1800; equation 6); a CI coder capable of generating at least one CI code (figure 1 section 3 page 1800; equation 5); and a carrier selector coupled to the CI coder and the pulse-train generator, the carrier selector adapted to impress the at least one CI code onto the sequence of pulse waveforms to shape the predetermined spectrum (figure 1 section 3 page 1800; equation 7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants Admitted Prior art (AAPA) in view of Nassar ("Introduction of carrier interference to spread spectrum multiple access", 1999 Emerging Technologies Symposium Wireless Communications and Systems, 12-13 April 1999 Page(s):4.1 - 4.5).

As per claim 1, AAPA discloses a symbol-mapping module adapted to allocate a predetermined number of data bits to a predetermined set of subchannels (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "tone ordering" block); a carrier-generator module adapted to associate the input symbols with at least one set of subchannels and generate a corresponding time-domain sequence representing a data-payload signal (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "IDFT" block); and an unloaded channel-encoding module adapted to select unloaded subchannels for transmission of at least one PAPR-reduction signal (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.7.3 pages 239-240; section 7.2.6 page 235, figure 7.21 "tone ordering block" and Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580). AAPA doesn't disclose a CI coder adapted to perform at least one predetermined combination of data spreading and channel coding to produce a plurality of input symbols. Nassar discloses a CI coder adapted to perform at least one predetermined combination of data spreading and channel coding to produce a plurality of input symbols (figure 4, section 3 pages 2 and 3). AAPA and Nassar are analogous art because they are from the same field of endeavor of multicarrier systems. At the time of the invention, it would have

been obvious to a person of ordinary skill in the art to incorporate the Carrier Interferometry disclosed by Nassar in the multicarrier system disclosed by AAPA. The suggestion/motivation for doing so would have been to improve the performance of the system (Nassar abstract).

As per claims 2, AAPA and Nassar disclose claim 1, AAPA also discloses to select and generate at least one unloaded subchannel for combining with the time-domain sequence when the time-domain sequence exceeds a predetermined power threshold (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 4.1 second paragraph page 583).

As per claims 3, AAPA and Nassar disclose claim 2, AAPA also discloses that the unloaded channel-encoding module is adapted to generate PAPR-reduction signals in unloaded subchannels and combine the PAPR-reduction signals with the time-domain sequence until the time-domain sequence power drops below a predetermined threshold (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 4.2 second paragraph page 584).

As per claims 4, AAPA and Nassar disclose claim 1, AAPA also discloses that the symbol-mapping module is adapted to generate unloaded subchannels by not loading subchannels that are compromised by adverse channel conditions (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the

Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580).

As per claims 5, AAPA and Nassar disclose claim 1, AAPA also discloses that the unloaded channel-encoding module is adapted to maintain the data-payload signal below a predetermined clipping threshold (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 figure 2 page 580; and section 4.2 second paragraph page 584).

As per claims 6, AAPA and Nassar disclose claim 1, AAPA also discloses that the unloaded channel-encoding module is adapted to combine the at least one PAPR-reduction signal with at least one of the plurality of input symbols and the data-payload signal (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 figure 2 page 580).

As per claims 7, AAPA and Nassar disclose claim 1, AAPA also discloses to cease loading at least one predetermined subchannel that is below at least one predetermined channel-quality metric such that the unloaded channel-encoding module is capable of selecting said predetermined subchannel for transmission of at least one PAPR-reduction signal (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580).

As per claims 8, AAPA and Nassar disclose claim 1, AAPA also discloses to allocate a predetermined number of data bits to at least one of a set of subchannels including space-frequency subchannels, space-time subchannels, CI phase-space subchannels, spatial sub-channels, and polarization subchannels (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580).

As per claims 9, AAPA and Nassar disclose claim 1, AAPA also discloses to select which of a plurality of sequence permutations of the predetermined number of data bits results in the greatest reduction of PAPR in the data-payload signal(Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 page 580).

As per claim 10, AAPA discloses a sub-carrier generator adapted to map the at least one set of coded symbols onto a plurality of subcarriers (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "IDFT" block); a plurality of combiners adapted to combine sets of the plurality of carriers for producing a plurality of coded time-domain sequences that are characterized by low PAPR (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "P/S buffer" block); and a plurality of power

amplifiers coupled to the plurality of combiners, the amplifiers adapted to amplify the plurality of coded time-domain sequences (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "gain scaler" block). AAPA doesn't disclose a CI coder adapted to spread at least one data sequence with at least one set of CI codes for generating at least one set of CI-coded symbols. Nassar discloses a CI coder adapted to spread at least one data sequence with at least one set of CI codes for generating at least one set of CI-coded symbols (figure 4, section 3 pages 2 and 3). AAPA and Nassar are analogous art because they are from the same field of endeavor of multicarrier systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Carrier Interferometry disclosed by Nassar in the multicarrier system disclosed by AAPA. The suggestion/motivation for doing so would have been to improve the performance of the system (Nassar abstract).

As per claims 11, AAPA and Nassar disclose claim 10, AAPA also discloses an amplified-signal combiner coupled to the plurality of power amplifiers (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 figure 2 page 580).

As per claims 12, AAPA and Nassar disclose claim 10, AAPA also discloses at least one of a set including an antenna, a waveguide, and a multi-port junction (Gatherer and Polley, "Controlling clipping probability in DMT transmission",

Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), abstract and overview).

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants Admitted Prior art (AAPA) in view of Wiegandt ("Overcoming peak-to-average power ratio issues in OFDM via carrier-interferometry codes", VTC 2001 Fall. IEEE VTS 54th Vehicular Technology Conference, 2001, Volume 2, 7-11 Oct. 2001 Page(s): 660 - 663 vol.2)

As per claim 1, AAPA discloses a symbol-mapping module adapted to allocate a predetermined number of data bits to a predetermined set of subchannels (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "tone ordering" block); a carrier-generator module adapted to associate the input symbols with at least one set of subchannels and generate a corresponding time-domain sequence representing a data-payload signal (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "IDFT" block); and an unloaded channel-encoding module adapted to select unloaded subchannels for transmission of at least one PAPR-reduction signal (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.7.3 pages 239-240; section 7.2.6 page 235, figure 7.21 "tone ordering block" and Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on

Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580). AAPA doesn't disclose a CI coder adapted to perform at least one predetermined combination of data spreading and channel coding to produce a plurality of input symbols. Wiegandt discloses a CI coder adapted to perform at least one predetermined combination of data spreading and channel coding to produce a plurality of input symbols (figure 2, section II pages 660 and 661). AAPA and Wiegandt are analogous art because they are from the same field of endeavor of multicarrier systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Carrier Interferometry disclosed by Wiegandt in the multicarrier system disclosed by AAPA. The suggestion/motivation for doing so would have been to improve the performance of the system and further reduce the PAPR (Wiegandt abstract).

As per claims 2, AAPA and Wiegandt disclose claim 1, AAPA also discloses to select and generate at least one unloaded subchannel for combining with the time-domain sequence when the time-domain sequence exceeds a predetermined power threshold (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 4.1 second paragraph page 583).

As per claims 3, AAPA and Wiegandt disclose claim 2, AAPA also discloses that the unloaded channel-encoding module is adapted to generate PAPR-reduction signals in unloaded subchannels and combine the PAPR-reduction signals with the time-domain sequence until the time-domain sequence power drops below a predetermined threshold (Gatherer and Polley, "Controlling clipping probability in DMT transmission",

Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 4.2 second paragraph page 584).

As per claims 4, AAPA and Wiegandt disclose claim 1, AAPA also discloses that the symbol-mapping module is adapted to generate unloaded subchannels by not loading subchannels that are compromised by adverse channel conditions (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580).

As per claims 5, AAPA and Wiegandt disclose claim 1, AAPA also discloses that the unloaded channel-encoding module is adapted to maintain the data-payload signal below a predetermined clipping threshold (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 figure 2 page 580; and section 4.2 second paragraph page 584).

As per claims 6, AAPA and Wiegandt disclose claim 1, AAPA also discloses that the unloaded channel-encoding module is adapted to combine the at least one PAPR-reduction signal with at least one of the plurality of input symbols and the data-payload signal (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 figure 2 page 580).

As per claims 7, AAPA and Wiegandt disclose claim 1, AAPA also discloses to cease loading at least one predetermined subchannel that is below at least one

predetermined channel-quality metric such that the unloaded channel-encoding module is capable of selecting said predetermined subchannel for transmission of at least one PAPR-reduction signal (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580).

As per claims 8, AAPA and Wiegandt disclose claim 1, AAPA also discloses to allocate a predetermined number of data bits to at least one of a set of subchannels including space-frequency subchannels, space-time subchannels, CI phase-space subchannels, spatial sub-channels, and polarization subchannels (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 first paragraph page 580).

As per claims 9, AAPA and Wiegandt disclose claim 1, AAPA also discloses to select which of a plurality of sequence permutations of the predetermined number of data bits results in the greatest reduction of PAPR in the data-payload signal(Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 page 580).

As per claim 10, AAPA discloses a sub-carrier generator adapted to map the at least one set of coded symbols onto a plurality of subcarriers (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21

"IDFT" block); a plurality of combiners adapted to combine sets of the plurality of carriers for producing a plurality of coded time-domain sequences that are characterized by low PAPR (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "P/S buffer" block); and a plurality of power amplifiers coupled to the plurality of combiners, the amplifiers adapted to amplify the plurality of coded time-domain sequences (AAPA page 3 lines 10-30; T. Starr, J. M. Cioffi and P. J. Silverman, "Understanding Digital Subscriber Line Technology", published by Prentice-Hall, 1999, section 7.2.6 page 235, figure 7.21 "gain scaler" block). AAPA doesn't disclose a CI coder adapted to spread at least one data sequence with at least one set of CI codes for generating at least one set of CI-coded symbols. Wiegandt discloses a CI coder adapted to spread at least one data sequence with at least one set of CI codes for generating at least one set of CI-coded symbols (figure 2, section II pages 660 and 661). AAPA and Wiegandt are analogous art because they are from the same field of endeavor of multicarrier systems. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate the Carrier Interferometry disclosed by Wiegandt in the multicarrier system disclosed by AAPA. The suggestion/motivation for doing so would have been to improve the performance of the system and further reduce the PAPR (Wiegandt abstract).

As per claims 11, AAPA and Wiegandt disclose claim 10, AAPA also discloses an amplified-signal combiner coupled to the plurality of power amplifiers (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the

Asilomar Conference on Signals, Systems, and Computers, (1997), section 3.1 figure 2 page 580).

As per claims 12, AAPA and Wiegandt disclose claim 10, AAPA also discloses at least one of a set including an antenna, a waveguide, and a multi-port junction (Gatherer and Polley, "Controlling clipping probability in DMT transmission", Proceedings of the Asilomar Conference on Signals, Systems, and Computers, (1997), abstract and overview).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. ITU-T G.992.1 ("Asymmetric Digital Subscriber Line (ADSL) transceivers" June 1999, (G.dmt) pages 10 and 40-42) provides further details in tone ordering. Natarajan ("Innovative pulse shaping for high-performance wireless TDMA", IEEE Communications Letters, Volume 5, Issue 9, Sept. 2001 Page(s): 372 – 374) discloses a pulse shaping scheme that enables receivers to demonstrate high performance in wireless fading environments using carrier interferometry pulse shaping, pulses are created by the superposition of N carriers. Zhiqiang ("Ultra wideband DS-CDMA via innovations in chip shaping", IEEE VTS 54th Vehicular Technology Conference, 2001. VTC 2001 Fall. Volume 4, 7-11 Oct. 2001 Page(s): 2470 - 2474 vol.4) discloses a chip shaping scheme, designed specifically for DS-CDMA systems, enables DS-CDMA to operate over non-adjacent frequency bands in a way that is identical to its operation if all these bands are made contiguous, the chip shape corresponds to an interferometry pattern created by the superposition of N carriers.

Natarajan ("Crest factor considerations in MC-CDMA with carrier interferometry codes", PACRIM. 2001 IEEE Communications Pacific Rim Conference on Computers and signal Processing, 2001, Volume 2, 26-28 Aug. 2001 Page(s):445 - 448 vol.2) discloses Carrier interferometry codes, applied to N-carrier MC-CDMA systems, enable 2N users to simultaneously share the system bandwidth with minimal degradation in performance. Wiegandt ("Overcoming peak-to-average power ratio issues in OFDM via carrier-interferometry codes", IEEE VTS 54th Vehicular Technology Conference, 2001, VTC 2001 Fall, Volume 2, 7-11 Oct. 2001 Page(s): 660 - 663 vol.2) discloses that carrier interferometry phase coding eliminates peaks in the signal envelope and in effect the problems associated with large PAPR. Yang (US 6504862 B1) reducing the peak power probability of a band limited Gaussian signal by clipping the signal to constrain its spectrum within error-shaped bounds. Shastri (US 6128350 A) discloses reducing peak to average power ratio in a radio frequency signal modulating a plurality of sub-carriers with a plurality of data symbol vectors to produce a first modulated signal; limiting the magnitude of the first modulated signal to produce a first limited modulated signal; demodulating the first limited modulated signal to recover the constellation points; predistorting the data symbol vectors to provide a minimum magnitude for in-phase and quadrature components thereof to produce predistorted data symbol vectors; modulating the plurality of carriers with the predistorted data symbol vectors to produce a second modulated signal; limiting the magnitude the second modulated signal to produce a second limited modulated signal; and reducing intermodulation products in the second limited modulated signal. Humphrey (US 6130918 A) discloses a reduction

in a peak-to-mean envelope power ratio of a multicarrier signal by applying an offset, indicative of a difference between a mean signal level and a midpoint level of the time domain signal, to the time domain signal. Leva (US 20020061068 A1) discloses method for reducing the peak-to-average power ratio of a multicarrier signal in transmitter/receiver systems generating an anti-peak signal; summing said anti-peak signal with the modulated signal; and transmitting the sum signal. Wang (US 20020168016 A1) discloses normalizing amplitude values and amplified these values by a hybrid amplifier that amplifies smaller amplitudes linearly and larger amplitudes non-linearly to reduce peak to average power ratio. Attallah (US 6985533 B2) discloses reducing peak to average power ratio in a multi-carrier modulation communication system using a probability distribution transformer. Redfern (US 7075999 B2) discloses that the PAR is reduced by using unloaded subchannels, which are unsuitable for carrying data because of noise or attenuation, to carry a "signal" that contains no payload; this signal on the unloaded subchannels is selected to have the effect of reducing the amplitude of the time domain signal to below the PAR amplitude threshold

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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08-28-2006